

Serial No. 10/673,892

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**LISTING OF CLAIMS:**

- 1           1. (currently amended) A method of watermarking a video signal to including  
2 include additional information therein, the method comprising the step of impressing said  
3 video signal being characterized in that at least a portion of said additional information  
4 has been impressed upon a chrominance portion of said video signal by placing it in at  
5 least one selected bit position of a value derived from an average of said chrominance  
6 portion over a block of said video signal.
  
- 1           2. (original) The invention as defined in claim 1 wherein said portion of said  
2 additional information is a bit.
  
- 1           3. (original) The invention as defined in claim 1 wherein said additional  
2 information replaces at least one bit of said value derived from said average of said  
3 chrominance portion over said block.
  
- 1           4. (original) The invention as defined in claim 1 wherein said value derived from  
2 an average of said chrominance portion over a block of said video signal is the average of  
3 the values of said chrominance portion for each pixel of said block.
  
- 1           5. (original) The invention as defined in claim 1 wherein said additional  
2 information is not substantially perceivable by the human visual system when said video  
3 signal including said additional information is displayed on a display device.

Serial No. 10/673,892

1           6. (original) The invention as defined in claim 1 wherein said additional  
2 information was impressed by changing the value of said chrominance portion of various  
3 pixels of said block, and wherein the magnitude of the change in value any pixel is a  
4 function of the amount of change that can be introduced into said pixel without resulting  
5 in an artifact that is substantially detectable by the human visual system.

1           7. (original) The invention as defined in claim 1 wherein said additional  
2 information was impressed by changing the value of said chrominance portion of various  
3 pixels of said block, and wherein the magnitude of the change in value any pixel does not  
4 exceed the amount of change that can be introduced into said pixel without resulting in an  
5 artifact that is substantially detectable by the human visual system.

1           8. (original) The invention as defined in claim 1 wherein the position of said  
2 selected bit is fixed for at least one block of at least one frame of said video signal.

1           9. (original) The invention as defined in claim 1 wherein the position of said  
2 selected bit is dynamically determined for at least one block of at least one frame of said  
3 video signal.

1           10. (original) The invention as defined in claim 1 wherein the position of said  
2 selected bit is determined based on a texture variance of said block.

1           11. (original) The invention as defined in claim 1 wherein said bit position into  
2 which said additional information is impressed is a bit of the integer portion of said value  
3 derived from said average.

1           12. (original) The invention as defined in claim 1 wherein said block of said  
2 video signal is in a reduced resolution format such that for each 2x2 luminance block of  
3 an original version of said video signal, had said original version of said video signal  
4 been in 4-4-4 representation, there remains only one Y, one U, and one V value.

Serial No. 10/673,892

1           13. (original) The invention as defined in claim 1 wherein said average of said  
2 chrominance portion over said block of said video signal is a DC coefficient of said block  
3 in a frequency domain representation of said block of said video signal.

1           14. (original) The invention as defined in claim 1 wherein said additional  
2 information was placed in said at least one selected bit position in a manner that makes a  
3 minimum change to said average.

1           15. (original) The invention as defined in claim 1 wherein said additional  
2 information was placed in said at least one selected bit position by adding a value to said  
3 average so as to make the value of said at least one bit position of said value derived from  
4 said average the same as said additional information to be impressed.

1           16. (original) The invention as defined in claim 1 wherein said additional  
2 information was placed in said at least one selected bit position by adding a value to said  
3 average so as to make said at least one bit position the same in said value derived from  
4 said average as said additional information to be impressed while making only a  
5 minimum change to the value of said average when impressing said data.

1           17. (original) The invention as defined in claim 1 wherein said additional  
2 information was placed in said at least one selected bit position by adding a value to said  
3 average so as to make said at least one bit position of said value derived from said  
4 average the same in value as said additional information to be impressed, said adding to  
5 said average having been achieved by adding an amount to the said chrominance portion  
6 of various pixels of said block, said additions to said pixel chrominance portions being  
7 made until a total of such additions equals the product of said value and the number of  
8 pixels in a block, said additions being independent of any other changes made to the  
9 chrominance portion of said pixels.

1           18. (original) The invention as defined in claim 1 wherein said video signal  
2 further comprises a margin signal added thereto to reduce the likelihood that said  
3 additional information will be eliminated should said video signal undergo quantization

Serial No. 10/673,892

1           19. (original) The invention as defined in claim 1 wherein said video signal  
2 further comprises a margin signal added thereto to reduce the likelihood that said  
3 additional information will be eliminated should said video signal undergo motion picture  
4 experts group (MPEG)-type encoding.

1           20. (original) The invention as defined in claim 1 wherein said additional  
2 information was placed in said at least one selected bit position by adding only a  
3 minimum necessary amount to said average so that in said value derived from said  
4 average said at least one bit position is made to have the same value as said additional  
5 information to be impressed and said value derived from said average is within a safe  
6 range.

1           21. (original) The invention as defined in claim 1 wherein said additional  
2 information is interleaved within said video signal with respect to its ordering prior to  
3 undergoing a process to be impressed therein.

1           22. (original) The invention as defined in claim 1 wherein said additional  
2 information is channel encoded within said video signal.

1           23. (original) Apparatus for embedding additional watermarking data within a  
2 video signal, comprising:

3           a color selection unit for selecting a chrominance portion of a block of said video  
4 signal to carry a portion of said additional watermarking data; and

5           a data adder that adds information to pixels of said block of said video signal  
6 thereby causing a change in the average value of said selected chrominance portion so as  
7 to incorporate at least a portion of said additional watermarking data within said changed  
8 average value.

1           24. (original) The invention as defined in claim 23 wherein said color selection  
2 unit comprises a prestored table in computer readable form that indicates for each area  
3 within at least a colorspace portion which chrominance portion should be selected for  
4 pixels within said each area.

Serial No. 10/673,892

1           25. (original) The invention as defined in claim 23 further comprising a block  
2 interleaver that interleaves said additional watermarking data prior to said additional  
3 watermarking data being incorporated within said changed average value.

1           26. (original) The invention as defined in claim 23 further comprising a channel  
2 encoder that channel encodes said additional watermarking data prior to said additional  
3 watermarking data being incorporated within said changed average value.

1           27. (original) The invention as defined in claim 23 wherein said data adder  
2 modifies only a said selected chrominance portion of said pixels and further comprising a  
3 multiplexer for multiplexing at least the unmodified chrominance portion of said pixels  
4 and said modified chrominance portion of said pixels.

1           28. (original) The invention as defined in claim 23 wherein said data adder  
2 further comprises a bit mapper.

1           29. (original) The invention as defined in claim 23 wherein said data adder  
2 further comprises a texture masking unit that determines a amount of change in said  
3 chrominance portion that a pixel can endure while minimizing the likelihood of a visible  
4 artifact resulting, and wherein said data adder adds no more than said amount to said  
5 pixel.

1           30. (original) The invention as defined in claim 23 wherein said data adder adds a  
2 further value to pixels of said block of said video signal thereby causing the resulting new  
3 average value to be within a safe range..

1           31. (original) The invention as defined in claim 23 wherein said data adder  
2 changes said average value by the least amount necessary to carry said additional  
3 watermark data.

Serial No. 10/673,892

1           32. (original) The invention as defined in claim 23 wherein said data adder adds a  
2 further value to pixels of said block of said video signal thereby causing the resulting new  
3 average value to be within a safe range and wherein said data adder further adds to pixels  
4 of said block the value that changes said average value by the least amount possible.

1           33. (original) The invention as defined in claim 23 wherein said video signal has  
2 the same resolution before and format after being watermarked by said video signal, but  
3 wherein said apparatus operates in a reduced resolution format such that for each 2x2  
4 luminance block of an of said video signal before watermarking, had said video signal  
5 before watermarking been in 4-4-4 representation, there remains only one Y, one U, and  
6 one V value in said reduced resolution format of said video signal.

1           34. (original) Apparatus for embedding additional watermarking data within a  
2 video signal, comprising:

3           means for selecting a chrominance portion of a block of said video signal to carry  
4 a portion of said additional watermarking data;

5           means for causing a change in the average value of said selected chrominance  
6 portion so as to incorporate at least a portion of said additional watermarking data within  
7 said changed average value.

1           35. (original) The invention as defined in claim 34 wherein said means for  
2 causing a change changes said average value by placing in a selected bit position thereof  
3 at least a portion of said additional information.

1           36. (original) The invention as defined in claim 34 wherein said means for  
2 causing a change changes said average value by placing in a selected bit position thereof  
3 at least a portion of said additional information and further changes said average value so  
4 it is within a safe range.

1           37. (original) The invention as defined in claim 34 wherein said means for  
2 causing a change effectuates said change in said average value by changing the values of  
3 said selected chrominance portion of one or more of the pixels of said block.

Serial No. 10/673,892

1           38. (original) A method for use in extracting watermark data from a watermarked  
2 video signal, wherein said watermark data is carried in at least one bit position of an  
3 average of the values of a chrominance portion of the pixels of at least one block of at  
4 least one frame, the method comprising the step of:

5           selecting a chrominance portion that is likely to be carrying said watermark data in  
6 said average of said values of said chrominance portion for said block;

7           extracting said watermark data from said average of said values of said selected  
8 chrominance portion.

1           39. (original) The invention as defined in claim 38 further comprising the step of  
2 determining which bit position of said average of said values is carrying said watermark  
3 data, and wherein said extracting step extracts the value of said bit position.

1           40. (original) The invention as defined in claim 38 further comprising the step of  
2 determining which bit position of said average of said values is carrying said watermark  
3 data as a function of a busyness of said block, and wherein said extracting step extracts  
4 the value of said bit position.

1           41. (original) The invention as defined in claim 38 wherein said determining step  
2 further comprises the steps of:

3           making a determination for each pixel in said block as to which chrominance  
4 portion is most likely to tolerate a change in its value and not introduce thereby a visible  
5 artifact; and

6           choosing as said selected chrominance portion the chrominance portion that was  
7 determined in said making step for the most pixels of said block.

1           42. (original) The invention as defined in claim 41 wherein said determination in  
2 said making step is made for at least one pixel of said block as a function of a prestored  
3 table in computer readable form that indicates for each area within at least a colorspace  
4 portion which chrominance portion should be selected for pixels within said each area.

Serial No. 10/673,892

1           43. (original) The invention as defined in claim 41 wherein said determination in  
2 said making step is made for at least one pixel of said block as a function of a calculation  
3 that indicates which chrominance portion should be selected for a pixel as a function of  
4 values of said pixel.

1           44. (original) The invention as defined in claim 38 further comprising the step of  
2 deinterleaving said watermark data after it is extracted.

1           45. (original) The invention as defined in claim 44 further comprising the step of  
2 channel decoding said deinterleaved extracted watermark data.

1           46. (original) The invention as defined in claim 38 further comprising the step of  
2 channel decoding said extracted watermark data.

1           47. (original) The invention as defined in claim 38 further comprising the step of  
2 computing said average of the values of said chrominance portion of the pixels of said at  
3 least one block of said at least one frame from the values of said chrominance portion of  
4 said pixels of said at least one block of said at least one frame.

1           48. (original) The invention as defined in claim 38 wherein said block of said  
2 video signal is in a reduced resolution format such that for each 2x2 luminance block of  
3 an original version of said video signal, had said original version of said video signal  
4 been in 4-4-4 representation, there remains only one Y, one U, and one V value.

1           49. (original) The invention as defined in claim 48 further comprising the step of  
2 decimating an original video signal to produce said watermarked video signal with a  
3 reduced resolution format such that for each 2x2 luminance block of said original video  
4 signal, had said original video signal been in 4-4-4 representation, there remains only one  
5 Y, one U, and one V value.



Serial No. 10/673,892

1           50. (original) A receiver for use in extracting watermark data from a  
2           watermarked video signal, wherein said watermark data is carried in at least one bit  
3           position of an average of the values of a chrominance portion of the pixels of at least one  
4           block of at least one frame, said receiver comprising:  
5                a color selector for indicating which chrominance portion is likely to be carrying  
6           said watermark data in said average of said values of said chrominance portion for said  
7           block;  
8                a block integrator for computing said average of said values of said chrominance  
9           portion for said block; and  
10           a bit selector that supplies as an output said watermark data from said average of  
11           said values of said selected chrominance portion.

1           51. (original) The invention as defined in claim 50 further comprising a block  
2           variance calculator that determines, based on at least one texture variance of said block,  
3           which bit position of said average of said values of said selected chrominance portion  
4           should be supplied as said watermark data by said bit selector.

1           52. (original) The invention as defined in claim 51 a decimator that produces said  
2           watermarked video signal from an original video signal such that for each 2x2 luminance  
3           block of said original video signal, had said original video signal been in 4-4-4  
4           representation, there remains only one Y, one U, and one V value in said watermarked  
5           video signal.

1           53. (original) A processor for embedding additional watermarking data within a  
2           video signal, said processor being operative:  
3                to select a chrominance portion of a block of said video signal to carry a portion  
4           of said additional watermarking data; and  
5                to cause a change in the average value of said selected chrominance portion so as  
6           to incorporate at least a portion of said additional watermarking data within said changed  
7           average value.

Serial No. 10/673,892

1           54. (original) Software in computer executable format for embedding additional  
2 watermarking data within a video signal, said software comprising:  
3           a module to select a chrominance portion of a block of said video signal to carry a  
4 portion of said additional watermarking data; and  
5           a module to a change in the average value of said selected chrominance portion so  
6 as to incorporate at least a portion of said additional watermarking data within said  
7 changed average value.

1           55. (original) Apparatus for use in extracting watermark data from a watermarked  
2 video signal, wherein said watermark data is carried in at least one bit position of an  
3 average of the values of a chrominance portion of the pixels of at least one block of at  
4 least one frame, said apparatus comprising:  
5           means for selecting a chrominance portion is likely to be carrying said watermark  
6 data in said average of said values of said chrominance portion for said block; and  
7           means for extracting said watermark data from said average of said values of said  
8 selected chrominance portion.

1           56. (original) A method for use in extracting watermark data from a watermarked  
2 video signal, wherein said watermark data is carried in at least one bit position of an  
3 average of the values of a chrominance portion of the pixels of at least one block of at  
4 least one frame, said method comprising the steps of:  
5           selecting a chrominance portion is likely to be carrying said watermark data in  
6 said average of said values of said chrominance portion for said block; and  
7           extracting said watermark data from said average of said values of said selected  
8 chrominance portion.

1           57. (currently amended) Apparatus for ~~for~~ embedding watermarking data within a  
2 video signal, comprising:  
3           means for receiving a video signal in a frequency domain based format; and  
4           means for changing a DC coefficient of at least one block of said video signal to  
5 carry at least a portion of said watermarking data.

Serial No. 10/673,892

1           58. (new) A system for embedding watermarking data within a video signal at a  
2 transmitter and recovering said watermarking data at a receiver, wherein:  
3           said transmitter comprises:  
4           a color selection unit for selecting a chrominance portion of a block of said video  
5 signal to carry a portion of said additional watermarking data; and  
6           a data adder that adds information to pixels of said block of said video signal  
7 thereby causing a change in the average value of said selected chrominance portion so as  
8 to incorporate at least a portion of said additional watermarking data within said changed  
9 average value; and  
10          said receiver comprises:  
11          a color selector for indicating which chrominance portion of said video signal  
12 incorporating at least a portion of said additional watermarking data is likely to be  
13 carrying said watermark data in said average of said values of said chrominance portion  
14 for received block;  
15          a block integrator for computing said average of said values of said chrominance  
16 portion for said received block; and  
17          a bit selector that supplies as an output said watermark data from said average of  
18 said values of said selected chrominance portion;  
19          wherein at least one of said color selection unit and said color selector comprises a  
20 prestored table in computer readable form that indicates for each area within at least a  
21 colorspace portion which chrominance portion should be selected for pixels within said  
22 each area.